

# Cognitive and personality predictors of financial literacy among adult Australians

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## Abstract

Poor financial literacy has been identified as one of the major social problems facing modern society with debt levels rising and a demonstrable lack of understanding of financial issues among some sections of the population. This study explored the relationship between various demographic, cognitive, and personality variables and financial literacy among a sample of 94 equity scholarship students attending a regional university. Data were collected on demographic characteristics such as age, years of work, level of education, income, and years of working. Cognitive measures included the two scales of the Shipley Institute of Living Scale (SILS) as measures of crystallised (Gc), and fluid Intelligence (Gf), respectively. A numeracy test was also administered. The IPIP-NEO short form was used to measure personality factors including Neuroticism, Conscientiousness, Agreeableness, Openness, and Extraversion. Results of hierarchical regression analyses indicated that Years-of-work was the only demographic variable significantly related to financial literacy. Cognitive abilities contributed incremental variance when added at step 2. Personality factors contributed further incremental variance when entered at step 3. Among all these variables, Numeracy was most strongly related to financial literacy, suggesting that training programmes targeting numeracy skills are likely to prove most beneficial in overcoming problems associated with poor financial literacy.

## Introduction

Financial literacy was defined in this study as the accrual of financial facts and specific, purposeful procedures that enable an individual to comprehend, evaluate, and communicate information about relevant monetary issues in order to efficiently manipulate monetary resources. Financial literacy research conducted overseas and in Australia has shown that levels of financial literacy across the populations are low. Low socio-economic groups, 18 to 24 year olds, and ethnic minorities are more likely

to mismanage monetary resources. In Australia, personal debt had reached more than 1/5 of total household income by 2004. Over 2005-2006 financial year, personal and business related bankruptcies increased by 7.44% (Insolvency and Trustee Service Australia, 2006). University student debt had risen to \$13 billion in 2006 and is increasing by \$2 billion a year (Campus Review, 2006).

The consequences of financial illiteracy are cumulative, with a flow-on effect through every level of society. It is therefore important to develop a better understanding of the psychological variables that contribute to this problem. The aim of the present study was to explore the role of various demographic, cognitive, and personality variables that influence financial literacy.

The first benchmark study of financial literacy among 43,236 Year 9 and 10 students in Australia consisted of a one-hour test with 40 multiple choice and 5 short answer questions that covered financial understanding, financial responsibility, financial enterprise, and financial competence (Commonwealth Bank Foundation [CBF], 2006). No gender differences were found. Around 50% of students could not interpret a bank statement, did not understand motor vehicle insurance or credit card fees and surcharges, and 20% to 30% of students could not determine the better-value supermarket items, how to withdraw specific sums of money from an Automatic Teller Machine (ATM), and failed to recognise indications of Internet fraud (CBF, 2006). Although 80% of students understood everyday money matters, few were able to perform the calculations required to answer financial competence items because they lacked the numeracy skills to apply the knowledge (CBF).

Fogarty and Beal's (2005) study of Australian university students employed a multiple choice test to assess five areas of financial skill and knowledge. It included basic financial concepts, financial markets and instruments, financial planning, financial analysis and decisions, and insurance. Results indicated that demographic variables; age, years of work, and income were positively related to financial literacy.

Fogarty and MacCarthy (2006) extended the set of predictor variables when they set out to determine whether measures of cognitive ability influenced financial literacy scores once demographic variables were controlled. The tests included general knowledge (crystallised intelligence) and Cattell's Matrices (fluid intelligence) from the Gf/Gc Quickie Test Battery (Stankov, 2003), financial literacy (Fogarty and Beal, 2005), and numeracy (Statistics Canada, 2003). Demographic information included gender, age, level of schooling, employment status, occupation, years of work, and annual income. The total average score for the financial literacy test was 61.7%. Many of the participants were employed in professional roles and had achieved higher levels of education, which may explain the better performance in comparison to average performances ( $\approx 50\%$ ) in previous studies. Consistent with research, significant positive relationships were found between financial literacy and levels of schooling and income but inconsistent with previous research, age and years of work were not related to financial literacy. Performance on basic financial concepts and financial planning sections was better than performance on financial markets and instruments, financial analysis and decisions, and insurance. This was consistent with previous findings (e.g., Fogarty & Beal).

Fogarty and MacCarthy (2006) found that all measures of cognitive ability were significantly and positively related to financial literacy. Hierarchical regression analyses showed that education and income explained 26% of the variance in financial literacy scores and cognitive abilities an additional 15%. Cognitive abilities, when assessed alone, explained 28% of the variance in financial literacy scores, with both numeracy and Gc contributing unique variance (Fogarty & MacCarthy). Although it is known that cognitive abilities play a major role in scholastic achievement and career progression, Fogarty and MacCarthy's study was the first to explore their role in financial literacy.

While cognitive abilities are important resources for the acquisition of financial literacy and solving problems relating to financial matters, intellectual problem solving also involves motivational and emotional processes. Personality traits may have enduring developmental effects on cognitive abilities, in particular on Gc. Along these lines, a relationship between Conscientiousness and educational achievement has been found repeatedly (Heinström, 2003). This relationship is present even when ability is controlled (Conrad, 2006). Given the possible influence of personality characteristics such as impulsiveness on purchasing behaviours, it was felt that personality may also have some unique relationship with financial literacy. One of the aims of the present study was to examine the influence of

personality on financial literacy after controlling for other known correlates of financial literacy.

The hypotheses tested in this study were as follows:

H1: That positive relationships exist between financial literacy and socio-economic status, age, level of education, and years-of-work.

H2: That measures of numeracy, crystallised intelligence (Gc), and fluid intelligence (Gf) will be positively related to measures of financial literacy and contribute incremental validity after controlling for demographics.

H3: That measures of personality will be related to measures of financial literacy and will account for a significant proportion of the variance in financial literacy scores above that contributed by cognitive and demographic variables.

## Method

### Participants

The sample of 94 participants consisted of University of Southern Queensland (USQ) students. The majority of participants were female (71%), under 25 years of age (71%), and were of European descent (84%). The majority of participants (80%) reported work histories of fewer than 10 years, with 9% of those having had no paid employment. Thirty percent of those who were working or had worked were employed in unskilled, semiskilled, or assistant positions. The maximum annual income reported did not exceed \$50,000 and the majority of the sample (83%) reported incomes of less than \$20,000. A large proportion of the participants shared with other singles (47%) or lived alone (16%).

### Instruments

The financial literacy instrument consisted of 30 multiple choice questions, each with four options that measured six areas of financial skill and knowledge including student knowledge, basic financial concepts, financial markets and instruments, financial planning, financial analysis and decisions, and insurance. The student knowledge section was added to measure financial knowledge considered relevant to a student population. The test was limited to 12 minutes. The dependent variables were the six subscale scores (maximum score of 5) and the total score (range 1 to 30).

The Shipley Institute of Living Scale (SILS) replaced the general knowledge test and Cattell's matrices employed in Fogarty and MacCarthy (2006) study. The SILS is administered in a standardised format to individuals or groups and comprises two subscales, each limited to 10 minutes. The 40-item SILS vocabulary subscale is an appropriate measure of crystallised intelligence involving "acquired knowledge, long-term memory, verbal

comprehension, concept formation, and reading ability” (Zachary, 1991, p. 19). The 20-item abstraction subscale is an appropriate measure of fluid intelligence involving abstract thinking, verbal and numerical concept formation, attention to detail, analysis and synthesis, cognitive flexibility, concentration, mental alertness, intellectual speed, and both intermediate- and long-term memory, as well as specific vocabulary and arithmetic skills (Zachary, 1991, p.19).

The measure of numeracy (Statistics Canada, 2003) consisted of 17 multiple choice items that required computational skills and the sort of mathematically related knowledge required for everyday tasks. Items included interpreting a temperature conversion scale and simple graphs, calculating grocery percentage discounts, simple probability, meal and mileage allowance, floor tile coverage, and the cost of a newspaper classified advertisement. This test was limited to 10 minutes.

The open access 120-item Web version of IPIP NEO short form was used to measure personality traits in this present study. The IPIP inventory measures each of the Big Five factors and the six facets belonging to each of the factors. Facets of Neuroticism include Depression, Self-Consciousness, Anger, Immoderation, Anxiety, and Vulnerability. Extraversion facets include Friendliness, Gregariousness, Assertiveness, Activity Level, and Excitement-Seeking. Openness to experience facets include Imagination, Artistic Interests, Emotionality, Adventurousness, Liberalism, and Intellect. Agreeableness facets include Trust, Morality, Altruism, Cooperation, Modesty, and Sympathy. Conscientiousness facets include Self-Efficacy, Orderliness, Dutifulness, Achievement-Striving, and Self-Discipline. This form of the IPIP presents statements with a five-option response format ranging from 1 (*very inaccurate*) to 5 (*very accurate*).

## Procedure

This study was conducted within a larger project undertaken by USQ Student Services and the Department of Psychology. Scholarship recipients were recruited by letter and telephone calls. Data were collected from 94 participants over 19 group-testing sessions. Each session was conducted according to a standardised format and lasted for approximately an hour and a quarter. Test sequencing alternated for each session to counterbalance order effects. The demographic and personality sections were completed first and last, respectively, in every session. The project was approved by the USQ Human Research Ethics Committee.

## Results

Table 1 lists the descriptive statistics for the main variables and the subscales of the Financial Literacy Test. The overall financial literacy performance was 51.7%, with only 35% of the participants achieving 18/30. Scores ranged from 2/30 to 26/30. The numeracy mean was 60.7% with a score range of 2/17 to 17/17. Approximately 61% ( $n = 57$ ) achieved a score of 10/17 or more.

Table 1. *Descriptive Statistics for All Variables*

Test	Possible Range	M	SD
IPIP-NEO			
Agreeableness	24-120	91.38	9.71
Conscientiousness	24-120	86.42	12.19
Openness	24-120	82.16	11.87
Neuroticism	24-120	70.75	14.39
Extraversion	24-120	80.01	11.86
Numeracy	0-17	10.32	3.69
Vocabulary (Gc)	0-40	30.33	4.69
Abstraction (Gf)	0-20	16.52	2.05
Financial Literacy	0-30	15.51	4.31
Student Knowledge	0-5	2.49	0.95
Basics	0-5	3.31	1.30
Markets	0-5	2.05	1.31
Planning	0-5	3.48	1.02
Decisions	0-5	2.27	1.14
Insurance	0-5	1.91	1.11

SILS vocabulary (Gc) performance mean was 75.8% with a score range of 13/40 to 40/40. SILS abstraction (Gf) scores ranged from 10/20 to 20/20 with an overall average performance of 82.6%. Consistent with previous research, the 18 to 24 years age group had the lowest mean performance and the 45 to 64 years age group scored the highest.

The ordering of means for the subscales of the Financial Literacy test was similar to that obtained by Fogarty and MacCarthy (2006) with students weak on financial markets, insurance, and financial decision making. The pattern formed three groupings shown in Figure 1, where Insurance (I), Markets and instruments (M&I), Analysis and decisions (A&D), Student knowledge (SK), Basic concepts (BC), and Planning (P) are arranged in ascending means and the absence of overlap indicates significant difference between subscales.

We attach no particular significance to this ordering because the present study was not concerned with areas of strength or weakness. However, we note that internal consistency reliability estimates could not be calculated for these timed tests, so these replications of well-established findings are useful indicators of the reliability of the data we have gathered here.

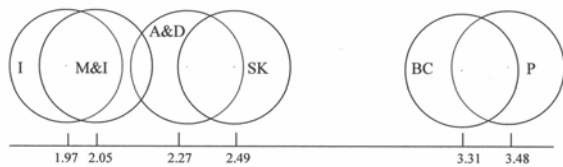


Figure 1. The pattern of financial literacy subscales. Means are shown on the base line.

Hypotheses were tested by calculating correlations and, where appropriate, by the use of hierarchical regression analyses. Relationships between variables are presented in Table 2. Years-of-work was the only demographic variable significantly related to financial literacy. The first hypothesis was therefore only partially supported.

To test the second hypothesis, we used a combination of correlations and hierarchical regression analysis. All cognitive variables were positively related to financial literacy and to each other, thus satisfying the first part of H2. Entering

demographic variables in the first step and cognitive variables in the second step revealed that while gender, age group, level of education, years in workforce, and income level explained 2% (adjusted) of the variance in financial literacy [ $R^2 = .07$ , Adjust  $R^2 = .02$ ,  $F(5, 84) = 1.27$ ,  $p > .05$ ]. The addition of cognitive abilities explained a further 37% [ $R^2_{change} = .37$ ,  $F(3, 81) = 17.90$ ,  $p < .001$ ]. Inclusion of all variables to the model explained 39% (adjusted) of the variance [ $R^2 = .44$ , Adjust  $R^2 = .39$ ,  $F(8, 81) = 7.98$ ,  $p < .001$ ]. Therefore, H2 was supported.

H3 was also tested by a combination of correlations and regression analysis. Table 2 shows that Personality factors were not related to financial literacy. A hierarchical regression analysis assessed the incremental variance contributed by the personality variables after controlling for demographic and cognitive variables. While demographic and cognitive variables explained 38% (adjusted) of the variance in financial literacy [ $R^2 = .44$ , Adjust  $R^2 = .38$ ,  $F(8, 75) = 7.39$ ,  $p < .05$ ], the addition of personality factors in step two explained a further 6% [ $R^2 = .53$ , Adjust  $R^2 = .44$ ,  $F(5, 70) = 2.69$ ,  $p < .05$ ]. H3 was therefore supported, but only after controlling for the influence of other variables.

Table 2. Correlations Among Demographic, Cognitive and Personality Variables, and Financial Literacy

Variable	2	3	4	5	6	7	8	9	10	11	12	13	14
(1) Gender	-.07	-.08	-.18	-.19	.23*	.04	.03	.14	.04	-.07	.12	-.03	-.01
(2) Age group	-	.19	.65**	.29**	.09	.11	.06	.04	-.05	.22*	-.24*	-.31**	.11
(3) Education		-	.04	-.02	.08	.14	.15	.19	-.06	.07	-.13	-.23*	.01
(4) Years work			-	.39**	-.10	.05	.02	-.05	.06	.30**	.03	-.01	.25*
(5) Income				-	-.03	-.05	-.01	-.13	.05	.08	-.04	-.10	.08
(6) Agreeableness					-	.22*	.37**	-.09	.00	.20	-.05	.09	-.08
(7) Conscientiousness						-	.15	-.31**	.27*	-.03	-.19	-.08	.01
(8) Openness							-	-.04	.27**	.16	-.07	-.05	-.03
(9) Neuroticism								-	-.49**	-.21*	-.05	-.10	-.18
(10) Extraversion									-	-.14	-.01	.02	-.04
(11) Vocabulary (Gc)										-	.33**	.40**	.42**
(12) Abstraction (Gf)											-	.56**	.37**
(13) Numeracy												-	.57**
(14) Financial literacy													

Note.  $N = 94$ ,  $n$  ranges from 84 to 94. \* $p < .05$ . \*\* $p < .01$ .

### Discussion

Contrary to previous findings, the only relationship among the demographic variables and financial literacy was for years-of-work. Our explanation for this failure to replicate has to do with the homogeneity of the sample used in the present study. All 94 participants were young people commencing study at university, assisted by equity scholarships. The lack of variability in demographic characteristics acted as a real-life control for demographic differences evident in more generally representative samples.

Participants' knowledge of basic financial concepts and financial planning were almost equivalent and significantly better than their understanding of financial analysis and decisions, financial markets and instruments, and insurance. However, student knowledge, a section introduced in the present study, was ranked third in performance despite the relevant content that should have been familiar to the participants. We did not expect this outcome.

All measures of cognitive abilities were positively related to financial literacy and contributed incremental variance above the contributions made by demographic variables. This study therefore

replicated Fogarty and MacCarthy's (2006) finding that cognitive abilities are important predictors of financial literacy. The first-order correlations indicate that Numeracy was the most important of the cognitive predictors. The Commonwealth Bank Foundation's recent benchmarking study (CBF, 2006) also noted the importance of numeracy skills. However the CBF study did not include a range of cognitive measures, so it was not possible to say whether some cognitive measures have better predictive validity than others. The present study addressed that gap in the literature by including measures of Gf, Gc, and numeracy. We note that the type of numeracy measure employed in this study, with its emphasis on everyday calculation skills, was more strongly related to financial literacy than either of the indicators of general fluid (Gf) and general crystallized (Gc) intelligence. We also note that this numeracy test is not as highly loaded on Gc as those used in previous research. Given this situation, we are not sure whether Gf or Gc is the more important immediate determinant of financial literacy scores. Gf is important to the extent to which financial literacy involves the application of general problem solving techniques to new situations. Gc is important to the extent to which financial literacy involves the application of acquired knowledge to everyday problems. The numeracy test was a good predictor because it involved elements of both Gf and Gc. These speculations about relative importance aside, we can say that cognitive variables should be taken into consideration when addressing causes of poor financial literacy. It would be a mistake to focus exclusively on demographic factors.

The third aim of our study was concerned with the association between personality factors and financial literacy. We were breaking new ground in this regard and the aim was purely exploratory, except perhaps for an expectation that Conscientiousness would be related to financial literacy simply because it is known to correlate with other aspects of intellectual achievement.

Our findings indicated that Neuroticism and Agreeableness emerged from among the factors as the most influential of personality factors. This finding is of interest because, as is evident from Table 2, none of the personality variables was related to Financial Literacy. Neuroticism was the only personality factor that approached significance ( $r = -.18, p = .05$ ) and, along with Agreeableness, it was also the factor responsible for the significant outcome when controlling for demographic and cognitive variables. Because of the weak effect sizes, however, we caution against attaching too much importance to this outcome until they can be replicated. The limitations of the current study, especially in relation to

restriction in range for many of the demographic variables, add further weight to this general caution.

In conclusion, financial literacy research is a necessary response to the obvious deficiency of financial management skills in today's society. Understanding the contribution that cognitive abilities and personality can make to the acquisition of financial knowledge and skills will provide us with the means to formulate more effective intervention and remediation programs. Previous research has concentrated on demographic predictors of financial literacy. Our findings are a reminder that other aspects of individual differences should also be taken into account and that the field of individual differences provides rich material for further exploration.

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